(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 September 2003 (12.09.2003)

PCT

(10) International Publication Number
WO 03/074363 A1

(51) International Patent Classification[7]: B65B 31/00

(21) International Application Number: PCT/US03/02997

(22) International Filing Date: 31 January 2003 (31.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/085,447 28 February 2002 (28.02.2002) US

(71) Applicant *(for all designated States except US)*: **KOCH EQUIPMENT LLC** [US/US]; 1414 West 29th Street, Kansas City, MO 64108 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **KNOWLTON, Scott** [US/US]; 2613 NW 1st St., Blue Springs, MO 64050 (US). **GROVE, Timothy, A.** [US/US]; 318 N. Delaware, Independence, MO 64050 (US).

(74) Agent: **COLLINS, John, M.**; Hovey Williams LLP, 2405 Grand Blvd., Suite 400, Kansas City, MO 64108 (US).

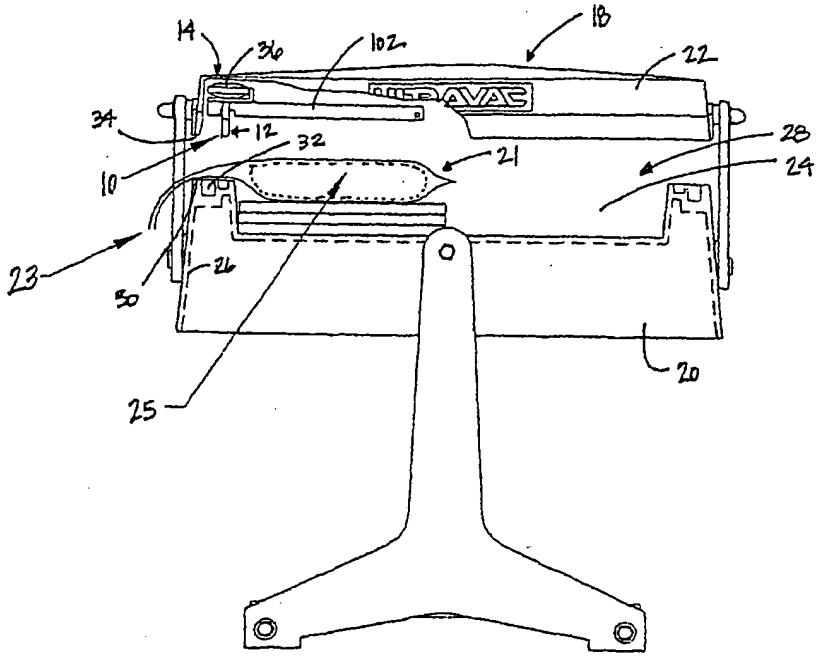
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: VACUUM PACKAGING APPARATUS AND METHOD




(57) Abstract: A vacuum packaging device having a lid (22) for sealing over the cavity of a base and a cutting blade (10) and heat bar (12) attached thereto. The cutting blade (10) upon cutting leaves uncut portions on either side of the cut for evacuation of air.

WO 03/074363 A1

# VACUUM PACKAGING APPARATUS AND METHOD

## BACKGROUND OF THE INVENTION

### A. Field of the Invention

The present invention relates to a mechanism for use with a vacuum packaging apparatus. More particularly, the invention is a combined cutting blade and heating bar for use in cutting and sealing vacuum packing bags, and in particular, vacuum packaging bags containing oversized compressible content, such as fabric derived products.

### B. Description of the Related Art

Manufacturers often desire to package their products in air-tight or shrink wrapped bags. For example, a manufacturer may wish to seal a food product in an air-tight package to ensure its freshness or may wish to vacuum pack a compressible product in order to reduce the size of the packaging for shipping and handling. Also, it is sometimes either too expensive to package a product in a box or desirable to visibly display the product. In these cases, the manufacturer may shrink-wrap the product in a clear or colored plastic bag. This type of packaging allows the consumer in some instances to see the product, protects the product during shipping and, in certain instances, when the content can be compressed through the vacuum packaging process, reduces the size of the package.

Currently, machinery is available for packaging products in air-tight bags. This machinery typically comprises a base member having an upstanding wall defining an internal cavity in which a bagged product may be placed. A lid is movable over the base, the lid having a perimeter sealing element for forming a seal against the top of the wall of the base.

A movable heated element is connected to the lid. The heated element can be

extended downwardly against a portion of the base. Means are provided for evacuating the air from the cavity.

The prior art teaches several ways in which to pull vacuum through the bag and seal the container. One such approach is to place the bag in the cavity of the base, such that the open end of the bag is oriented so that it extends across a portion of the base, with the free end also located in a slot within the cavity. Thus the entire bag is placed within the cavity.

Once the bag is placed in the cavity, the lid is lowered and sealed against the base. The cavity, and thus the bag therein, is evacuated of air. The air leaves the bag through its open end located within the cavity. Evacuation of the air in the bag draws the bag tightly around the product and itself. The heated element is then heated and lowered against the bag. The heat element melts the bag distal of its open end, sealing it shut. Air is returned to the cavity, the lid opened, and the product is removed.

This packaging arrangement suffers the drawback that the entire bag must be located in the cavity in order to evacuate the air therein. When there is excess bag to wrap the product, the bag material is bunched around and often extends from the product. This bag material increases the total size of the package, and is visually unappealing.

To overcome the drawback of bunching when excess baggage is used, other vacuum packaging machines were designed to allow a user to leave the open end of the bag outside of the chamber during air evacuation. When using this type of device, the user places the product in the bag and pulls the end of the bag outside of the base. The user pulls the bag firmly outwardly, pulling the bag tightly around the product in the chamber, leaving only the amount of bag necessary to wrap the product around the

product in the chamber.

The user then lowers the lid, tightly holding the bag in place, preventing it from slipping back down into the chamber around the product. The vacuum packaging machine includes a segmented cutting blade and heating element for use with the vacuum packaging device, which may be connected to a single actuating device, or each connected to their own actuating devices. In either case, when the lid is closed, the segmented cutting blade, which extends across the width of the first vacuum package machine, cuts segmented portions of the bag located inside of the chamber, as illustrated by FIG. 2 (Prior Art). The cuts are segmented so that the bag, when cut, does not slip back down into the chamber around the product, but so that the excess bag can be easily removed from the bag containing the product after the bag is sealed.

Once the bag is cut, the air in the chamber and in the bag located inside of the chamber is evacuated, the air escaping from the bag through the cuts. After the vacuum is pulled through the chamber, the heating element is lowered, melting the bag distal and inward of the cut made in the bag, sealing it shut, as illustrated by FIG. 2 (Prior Art). The product is then removed from the container and the excess bag on the free end away from the seal is then removed.

Like the vacuum packaging machine having the entire bag located in the cavity, machines allowing for the open end of the bag located outside the chamber also suffer the difficulty of packaging large condensable items by pulling a vacuum through the package, and thereby cause the packaging to condense the product in the package. For example, such items subject to reduction though vacuum packaging are clothing, outdoor wear, sleeping bags and other flexible, resilient compressible materials. Under high vacuum packaging, such fabric derived products will compress in size by up to

thirty percent (30%) of their original volume.

Prior art vacuum packaging machines are not currently equipped to accommodate these type of compressible products. The prior art vacuum packaging machine, as discussed above, pulls a small vacuum to hold the chamber closed when the lid is initially shut, to create a seal between the lid and the base. In the case of packaging large pouches with sleeping bags or other like large clothing articles, this system would tear the pouch completely loose when the cutting blade cuts the bag immediately after the initial lid vacuum draw down, and thus disrupt the packaging cycle. Since during the initial draw down, the air inside the bag has no way to escape, the bag then becomes inflated during the initial vacuum draw down to form the seal around the lid. For objects in large bags, the bags tend to inflate much more than those in smaller bags. When the cutting blade first cuts the bag, the larger bags may prematurely separate the bag at the cut and disrupt the packaging processing.

## SUMMARY OF THE INVENTION

The present invention is a vacuum packaging machine that is designed to handle packages containing product that will compress in volume during packaging. The vacuum packaging device of the present invention has a base and lid. A cavity is located in the base in which a product to be packaged is positioned. The lid has a perimeter seal for sealing the lid over the cavity in the base. The device further includes an apparatus for evacuating air from the sealed cavity and the bag inside.

The vacuum packaging machine of the present invention has an elongated segmented cutting blade that is located in the center of the seal bar and is sized to leave sections of uncut pouch material on either side of the pouch (as shown in FIG. 3). Thus, the length of the blade is less than that of the bag.

The vacuum packaging machine also includes a heating element, which is used to seal the bag after the air is removed from the bag. In one embodiment of the invention, the cutting blade and heating element are connected to one another and to a mounting bar, which is connected to a single actuating device. This entire mechanism is preferably mounted to the lid. On the base, opposite of the mechanism, is an anvil, for engagement by the cutting blade and heating bar.

Accordingly, during the packaging process, a user places product in a bag, extending the open end of the bag across the anvil and positions the open end of the bag outside of the base, leaving the remainder of the bag containing product in the cavity of the base.

The user then closes the lid and a slight vacuum is drawn to seal the lid tightly against the base. With the bar unheated, the combined cutting mechanism and heating bar is then lowered, via the actuator, to cut spaced slits across a portion of the bag, leaving uncut sections of the bag on either side of the slit. Leaving sections of uncut bag on either side of the slit prevents the pouch trim from tearing both during the vacuum packaging process and thereafter. After the initial cut is made, the cutting and heating mechanism is then retracted.

The vacuum device then evacuates the air in the bag, compressing the contents of the bag when compressible materials are being packaged. The air in the bag escapes through the slits formed by the cutting blade in the portion of the bag that is cut. After the air is evacuated, the cutting and heating mechanism is then lowered, this time with the heating element heated, thereby sealing the end of the bag after the air has been fully evacuated from the bag. While the cutting bar does not extend the length of the bag, the heating element does extend across the length of the bag, thereby sealing the

bag across its entire length inward of the slit to prevent the re-entry of air into the bag.

Since the cutting element did not cut through the entire length of the bag, the excess pouch, instead of being removed, would remain with the bag. The excess bag, having a slit through only the mid-section, can then serve as a handle to the bag, which functions as an especially convenient way to carry light or large items. .

## BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the advantages thereof will be readily obtained as the same becomes better understood by references to the detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a front view of the vacuum packaging device in one embodiment of the invention with the lid of the vacuum packaging device partially open and having part of the lid partially cut away to show the combined heating bar and cutting blade and the positioning of the bag relative thereto;

FIG. 2 is a top perspective view of a bag sealed using a prior art vacuum packaging machine;

FIG. 3 is a top perspective view of a bag sealed using a vacuum packaging machine of the present invention;

FIG. 4 is an end view of the combined cutting blade and heat bar apparatus of the present invention mounted in a vacuum packaging device (shown in cross-section) and shown with a lid of the device open;

FIG. 5 is a view of the apparatus of FIG. 4, with the lid of the vacuum packaging device closed and the combined cutting blade and heat bar shown in a retracted position;

FIG. 6 is a view of the apparatus of FIG. 5 with the combined cutting blade and heat bar shown in an extended position;

FIG. 7 is a cross-sectional side view of the apparatus of FIG. 6 taken along line 7--7 thereof;

FIG. 8 is an enlarged, partial cut-away side view of the combined cutting blade and heat bar of FIG. 4;

FIG. 9 is an enlarged end view of the apparatus illustrated in the position of FIG. 8 through line 9--9 thereof; and

FIG. 10 is an enlarged cross-sectional end view of the apparatus in the position of FIG. 8 through line 10--10 thereof.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As illustrated by FIG. 1, the present invention is a vacuum packaging machine 18 that is designed to vacuum pack products that are not subject to reduction, such as food products, as well as items that are subject to reduction through vacuum packaging, such as clothing, outdoor wear, sleeping bags, other fabric derived products and other flexible, resilient compressible materials.

As illustrated by FIG. 1 and FIGS. 4-10, the vacuum packaging machine 18 of the present invention generally comprises a base 20, having a cavity 24 located therein, and a lid 22 that seals over the cavity 24 of the base 20. The cavity 24 is formed within an upstanding wall 26 of the base, the cavity having an open top end 28. The wall 26 has a flat top surface 30. At least a portion of the wall 26 includes a slot 32 in which a portion of a packaging bag 21 may be positioned.

The lid 22 has a mating surface for engagement with the top surface 30 of the wall 26 of the base 20, the lid 22 being designed to enclose the cavity 24 in the base 20. A seal 34 is positioned in the lid 22 for engagement with the top surface 30 of the wall 26 for sealing the lid 22 to the base 20. The machine 18 includes means (not shown) for evacuating the air from the enclosed cavity 24, as is well known in the art.

In accordance with one embodiment of the invention, a combined cutting blade 10 and heat bar 12 are mounted to the lid 22 of the vacuum packaging apparatus 18. The cutting blade 10 and heat bar 12 are connected to the actuating means 14, namely an expandable air bladder 36, for movement with respect to the lid.

In one embodiment of the invention, as illustrated by FIG. 7, the heating bar 12 extends across nearly the entire length of the lid 22, whereas the cutting blade 10 is positioned in the center of the lid 22 and is of a length that will not cut across the entire

packaging bag 21, but rather cuts only across the middle portion of the bag 21, as shown by FIG. 3, leaving uncut portions 27 at the ends of the bag 21.

As best illustrated in FIGS. 4-7, the cutting blade 10 comprises an elongate, thin metal member having a first side 38, second side 40 and cutting edge 42. While the cutting blade 10 may be a straight cutting edge, typically, the cutting blade 10 has a number of cutting teeth 44 disposed along the cutting edge 42 of the blade 10, so that the cutting blade 10 does not cut the packaging bag 21 completely through, but instead cuts the bag 21 so that several portions of the bag 21 remain unsevered.

As such, the cutting teeth 44 are arranged so that the blade 10 acts to cut the bag 21 in certain areas but not others (as shown in FIG. 3). Preferably, the sets 46 of the cutting teeth 44 are separated by non-cutting slot 48 areas extending upwardly into the blade 10 from the cutting edge. Again, it is not necessary to use a blade with non-cutting slots 48 since the blade 10 does not extend across the entire length of the bag 21.

The cutting teeth 44 are preferably only disposed on the first side 38 of the cutting blade 10, the second side 40 of the blade being flat. The cutting teeth 44 preferably have a cutting edge slope of about 60 degrees (sloping inwardly from the first side to the second side of the blade from the top of the tooth downwardly towards the cutting edge).

In one embodiment, each cutting tooth 44 is approximately 0.2 inches wide. The tooth 44 has a minimum tooth height of about 0.04-0.06 inches, and most preferably about 0.05 inches, and a maximum tooth height of about 0.145-0.165 inches, and most preferably about 0.155 inches.

The blade 10 may be constructed of any number of durable materials, but is

preferably constructed from stainless steel. The blade 10 in the present example is approximately 7 inches long. The length of the blade 10 may vary, depending upon the application for which it is used and the size of the packaging bag 21 being used in the machine 18.

A number of apertures extend through the blade 10. Screws 50 or similar mounting elements pass through the apertures for engagement with a base 54 of the heat bar 12, for mounting the blade to the actuating mechanism 14 (indirectly) as described in more detail below. The depth of the blade 10 and its point of attachment are chosen so that the ends of the teeth 44 extend below the bottom of the heat bar 12 by approximately 0.05-0.15 inches, and more preferably, about 0.1 inches, when the teeth have the configuration described above.

The heat bar 12 comprises a heat wire 52 mounted in the base 54. A cover 56 extends over the heat wire 52, preventing direct contact of the heat wire 52 with the bag 21.

The base 54 comprises an elongate mounting member having a first end 58 and second end 60. Preferably, the base 54 is constructed of a lightweight resin material. In order to stiffen the base 54, an insert 55 (as best seen in FIG. 10), such as a metal bar, fits within a slot in the base 54.

The base 54 is preferably slightly longer than the heating wire, at about 27.25 inches. As best illustrated in FIGS. 8 and 10, a first slot 62 extends through the base 54 from end 58 to end 60. The first slot 62 is preferably located adjacent a bottom edge 64 of the base 54 and receives the heat wire 52.

A second slot 66 extends into each end 58, 60 of the base 54 above the first slot 62. An aperture 68 extends through the base 54 from side to side at the location of the

second slot 66.

The wire 52 has a first end and a second end, corresponding to the ends 58, 60 of the base 54. The wire 52 is preferably constructed of metal, and has a rectangular cross-section. At its ends, the wire 52 first bends upwardly for extension along the ends 58, 60 of the base 54, and then bends inwardly.

To support the ends of the wire 52 and retain the wire in place, the wire extends over a lock bar 80 at each end. Preferably, the supporting/attaching structure is the same at both ends of the wire 52 and bar, and thus only one end will be described. As illustrated in FIG. 8, the lock bar 80, which is generally 'L'-shaped, extends from a slot in a pin 76 passing through the aperture 68. A set screw 79 extends inwardly from one side of the pin 76, engaging the lock bar 80 and retaining it in place. From the pin, the lock bar 80 extends outwardly towards the first end 58 of the base 54, and then downwardly towards the bottom edge 64.

The heat wire 52 extends upwardly over the lock bar 80 within the slot 66. The first end of the wire 52 is retained against the lock bar 80 and in the pin 76 via a set screw 78 which passes downwardly from the top edge of the base 54.

As illustrated in FIG. 5, a spring 74 extends between the end of a countersunk bore in the base 54 near the second slot 66 and the lock bar 80, pressing the lock bar 80 outwardly against the heat wire 52.

A cover 56 extends over the bottom edge 64 of the base 54 from the first end 58 to the second end 60. The cover 56 is preferably a Teflon® tape formed into a 'U'-shape. The tape is connected to each side of the base 54 and extends across the bottom edge 64 of the base 54.

As illustrated in FIGS. 4-6, the front side of the base 54 has an inset area for

acceptance of the cutting blade 10. A first number of apertures 82 pass through the base 54 of the heat bar 12 at the inset area. The first set of apertures 82 are designed for acceptance of the screws 50 (or other mounting members) which connect the cutting blade 10 to the base 54.

A second number of apertures 84 pass through the base 54 of the heat bar 12 slightly above the first set. The second set of apertures 84 are designed for mounting the heat bar 12 (with blade 10 connected thereto) to the actuating mechanism 14, as described below.

As best illustrated in FIGS. 5, 7 and 9, the actuating mechanism 14 comprises a means for moving/actuating the combined cutting blade 10 and heat bar 12 between a first (retracted) (FIG. 5) and a second (extended) (FIG. 6) position. Preferably, the actuating mechanism 14 comprises an air bladder 36. The air bladder 36 includes an inflatable element 86, such as a section of firehose or similar durable expandable material. The inflatable element 86 is mounted on a plate 88 having a flat surface and upstanding inside protective edge.

An air line 90 extends through the lid 22, an aperture in the plate 88, and into the inflatable element 86 of the air bladder 36. The air line 90 is connected to a source of high and low pressure air (not shown) for inflating and deflating the air bladder 36.

The air bladder 36 is connected to the cutting blade 10 and heat bar 12 via a mounting bar 92, as illustrated in FIGS. 7 and 10. The mounting bar 92 is approximately as long as base 54 of the heat bar 12 and thus slightly longer than the cutting blade 10. The mounting bar 92 has a first end 94 and second end 95 which are tapered to facilitate retraction of the mechanism along the sloping ends of the lid 22 of the vacuum packaging device 18, as best illustrated in FIG. 4.

Preferably, four large washers 96 are connected to each side of the mounting bar 92 with screws or the like. The base 54 of the heat bar 12 (to which the cutting blade 10 is connected by screws 50) is connected to the washers 96 with screws passing into the apertures 84 described above.

The mounting bar 92 is in turn connected to the flat portion of the plate 88 of the air bladder 36. Screws or similar attachment means pass through the plate 88 along its length and into mating apertures in the top edge of the mounting bar.

As connected, the mounting bar 92, the heat bar 12 and the cutting blade 10 move as one element when actuated by the air bladder 36, as described in more detail below. Thus, the cutting blade 10 and heat bar 12 are actuatingly coupled.

A wire 99 from an electrical power source (not shown) extends to electrical contact elements 98 connected to the mounting bar 92. Each contact element 98 has a first flat section which is attached via a screw or the like to the mounting bar 92. Each element further includes a 'U'-shaped, spring section. As illustrated, the spring section of the elements 98 contact the pin 76 to which the heat wire 52 is connected. The wire 99 is connected to the elements 98 for heating the heat wire 52. The elements 98 are mounted beyond the ends of the cutting blade 10, so as to not contact the cutting blade.

The entire mechanism is preferably hingedly connected to the lid 22 of the vacuum packaging device 18, as best illustrated in FIGS. 4-6. Two mounting blocks 100 (only one of which is illustrated) are connected to the inside of the lid 22 of the vacuum packaging device 18. An arm 102 extends from each mounting block 100 to a connection with the mounting bar 92 and plate 88.

Each arm 102 has a generally 'L'-shaped cross-section, and is generally about 15-16 inches, and most preferably about 15.75 inches long. The length of the arm 102

depends primarily on the size of the lid 22 in which the mechanism is mounted. Preferably, the arm 102 is connected at one end to the mounting block 100 near the center of the lid 22. The arm 102 is long enough that the combined cutting blade 10 and heat bar 12 are positioned adjacent the outer edge of the lid 22, as illustrated in FIG. 3. The arm 102 is hingedly connected to the mounting block 100 at a first end via a pin 104.

The second end of each arm 102 is connected to the ends, respectively, of the flat portion of the plate 88 (see FIG. 8). The arms 102 are connected to the plate 88 with screws or similar attachment means.

The second end of each arm 102 includes a slot 106 (FIG. 9) for mating engagement with a corresponding slot 108 (FIG. 10) in the top edge of the mounting bar 92. Preferably, the slot 106 in the arm 102 is longer than the mounting bar 92 is wide, and the slot 108 in the mounting bar 92 is deeper than the depth of the downwardly extending portion of the arm 102, to facilitate relative movement of the two elements. Further, in order to accommodate mounting of the arm 102 under the plate 88 and between the plate and mounting bar 92, the mounting bar includes a recessed top edge section 110 at each end.

Springs 112 bias the mechanism upwardly into a recessed position within the lid 22 when the air bladder 36 is deflated, as illustrated in FIGS. 4 and 6. Preferably, two pins 114 (see FIG. 7) extend downwardly from the plate 88 and engage a flange 116 extending inwardly from the inside surface of the lid 22. The springs 112 are mounted on the pins 114 between the flange 116 and plate 88.

An anvil 118 is positioned in the wall 26 of the base 20 of the vacuum packaging apparatus 18 directly below the cutting blade 10, as illustrated in FIGS. 3

and 4. Preferably, the anvil 118 comprises an elongate segment of neoprene extending within a slot in the wall 26 along that portion of the wall 26 beneath the mechanism of the present invention.

While one embodiment of the present invention uses a combination heating bar 12 and cutting blade 10, actuated by a single actuator 14, such as a air bladder 36, or other similarly functioning device, the present invention may also utilize a heating bar 12 that is separately actuated from the cutting blade 10. Furthermore, one skilled in the art can modify the arrangement of the cutting blade 10 and the heating bar 12 to be utilized in chamberless vacuum packaging machines 18 or in other types of vacuum packaging machines 18.

In operation, when packaging a bag using a chamber machine, a user will first select the appropriate length of the cutting blade 10 to be used in the vacuum packaging process. This is determined by the size of the vacuum packaging bag 21 and article or product 25 to be packaged. The length of the blade 10 should be selected so that the blade 10, as seen in FIG. 3, leaves enough pouch trim 27 on each side of the cut 35 to prevent the bag 21 from pulling away from the cutting edge of the machine 18 during operation when used in a chamber machine. Larger products 25 and products 25 that are reduced by a large percentage of their original size during packaging tend to pull away from the edge when the cutting blade first cuts the bag immediately proceeding the initial vacuum draw down. Thus, the user must select a cutting blade 10 length that leaves enough trim 27 on each side of the cut 35 to prevent the bag 21 from pulling away during evacuation, as illustrated by FIG. 3. In the non-chamber machines, or machines where there is decreased risk of the bag pulling away when cut after the initial draw down, the blade length may be selected solely based upon the desired

handle size, which is creating by opening the slit after vacuum packaging is completed.

Once the blade 10 length is selected, the user fits the vacuum packaging machine 18 with the blade 10. The user then opens the lid 22 of the vacuum packaging device 18 fitted with the mechanism of the present invention, as illustrated in FIG. 7. The user positions an item to be sealed with a bag 21 and places the bag 21 in the cavity 24 within the base 20 of the device 18, extending the open end 23 of the bag 21 outside of the device.

The user then closes the lid 22, as illustrated in FIG. 5. The seal 34 on the lid 22 seals the lid against the base 20. A slight vacuum is then drawn, evacuating some of the air from within the cavity 24. This partial vacuum is drawn in order to better seal the lid 22 to the base 20, and to prevent the lid 22 from raising when the cutting blade 10 is lowered and cuts the bag 21. Care is taken, however, not to draw an excessive vacuum, as such could have the effect of rupturing the bag 21, as the air within the bag 21 at that time has no path of escape.

The combined cutting bar 10 and heat bar 12 is then lowered into the position as illustrated in FIG. 6. In particular, air is forced through the air line 90 into the inflatable element 86 of the air bladder 36. Inflation of the air bladder 36 presses the combined cutting blade 10 and heat bar 12 downward until it engages the anvil 118, as illustrated in FIGS. 6, 9 and 10.

Most importantly, at this time the heat bar 12 is unheated. When in the extended position, the cutting bar 12 cuts the bag 21, across only the center portion of the bag, forming spaced slits therein and leaving uncut pouch trim 27 on either side of the bag 21. Air is then removed from the air bladder 36 through the air line 90, the air bladder collapsing and the spring force generated by the springs 112 pressing the

mechanism upwardly into the lid 22 as illustrated in FIG. 5. At the same time, full vacuum is drawn within the device 18, drawing the remaining air from the cavity 24 and the bag 21. The air in the bag 21 escapes through the slits cut in it by the cutting blade 10.

The heat wire 52 of the heat bar 12 is then heated, and the mechanism lowered to the positioned illustrated in FIG. 6 again. At this time, the heat bar 12 melts closed the bag 21 inward of the slits. The mechanism is again raised, air returned to the cavity 24, such as by venting to the outside atmosphere, and the user opens the lid 22. The user then removes the sealed bag 21. If desired, the user may then open the slit area 35 by breaking apart the perforated slit 35. With the slit open, the remaining pouch 21 with the center slit can serve as a handle for the convenient carrying of the packaged articles 25.

Notably, the cutting blade 10 extends below the heat bar 12 a sufficient distance to cut through the bag 21 when the mechanism is lowered against the anvil 118. This extension distance is chosen, however, so that the heat bar 12 still contacts the bag 21 as necessary to melt the bag closed. At the same time, the teeth 44 of the blade 10 do not penetrate so far into the anvil 118 so as to become lodged or stuck, which would hinder operation of the machine.

The sequence of (1) pulling initial vacuum; (2) lowering mechanism to cut the bag; (3) raising the mechanism and pulling full vacuum; (4) heating heat bar and lowering mechanism to seal bag; and (5) raising mechanism is preferably accomplished with relays or the like so as to be automatic.

While an air bladder 36 has been described as the preferred actuating device, many other similar mechanisms could be employed. For example, hydraulic or air

cylinders could be used to move the combined cutting blade and heat bar up and down. Additionally, while the present invention has been described using only one cutting blade 10, more than one cutting blade 10 could also be used with the present invention, which could be arranged to create more than one handle per package, or provide for the packaging of more than one package per cycle.

Further, the specific configuration of the heat bar 12, the cutting blade 10 or connecting apparatus could be changed substantially without falling from the scope of the invention. A wide variety of heating elements are well known in the art, and may be employed instead of the one described herein.

It will be understood that the above described arrangements of apparatus and the method therefrom are merely illustrative of applications of the principles of this invention and many other embodiments and modifications may be made without departing from the spirit and scope of the invention as defined in the claims.

## CLAIMS

What is claimed is:

1. A method of vacuum packaging a product comprising the steps of:

extending a cutting blade against a portion of a bag having an open end and a closed distal end;

cutting said bag with said cutting blade;

retracting the cutting blade;

evacuating air from inside said bag through the cut portion;

heating a heat bar; and

extending the heat bar to contact a part of said bag spaced from the portion of said bag cut with said cutting blade toward the distal closed end.

2. The method of claim 1, wherein said extending steps further comprise the step of inflating an air bladder connected to said connected cutting blade and heat bar.

3. The method of claim 1, wherein said cutting blade and heat bar are connected together as one element.

4. The method of claim 1, further including the step of melting said bag when said heat bar extends against said bag.

5. The method of claim 1, wherein said cutting step comprises the formation of a multiplicity of intermittent slits in said bag.

6. The method of claim 1, wherein the extending steps comprise connecting said heat bar to a first end of each arm of a pair of arms, and rotatably connecting said arms at their second ends to a lid of a vacuum packaging device.

7. The method of claim 6, wherein extending steps further comprise connecting said cutting blade to said heat bar and extending and retracting steps comprise simultaneously extending and actuating the cutting blade and heat bar.

8. The mechanism of claim 11, wherein said means for actuating comprises an air bladder.

9. A mechanism for use with a vacuum packaging machine which vacuum-seals a bag, the mechanism having a base with a cavity therein and a lid, and said mechanism comprising:

a heating bar;

at least one cutting blade connected to said heating bar, said at least one cutting blade being shorter in length than said heating bar such that said at least one cutting blade does not extend entirely across the bag whereby the cutting blade when used to cut the bag leaves at least the ends of the bag uncut;

an actuating mechanism for simultaneously actuating the cutting blade and the heating bar.

10. The mechanism of claim 9, wherein the at least one cutting blade has serrated edges.

11. The mechanism of claim 9, wherein the at least one cutting blade has a straight edge.

12. A mechanism for use in a vacuum packaging machine for vacuum sealing a bag, the machine having a base with a cavity therein and a lid, and said mechanism comprising:

a heating bar for mounting to the machine;

a first actuating device for actuating the heating bar;

a cutting blade for mounting to the machine;

a second actuating device for actuating the cutting blade; and

said at least one cutting blade being shorter in length than said heating bar such that said at least one cutting blade does not extend entirely across the bag such that the cutting blade when used to cut the bag leaves at least the ends of the bag uncut.

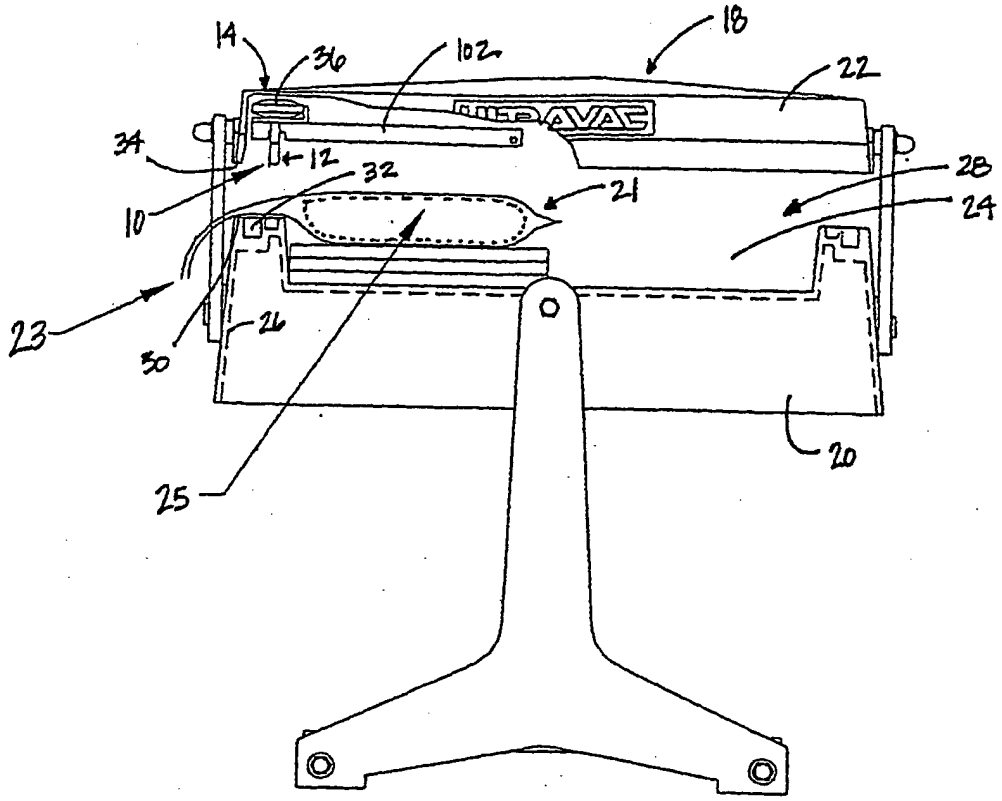



Fig. 1

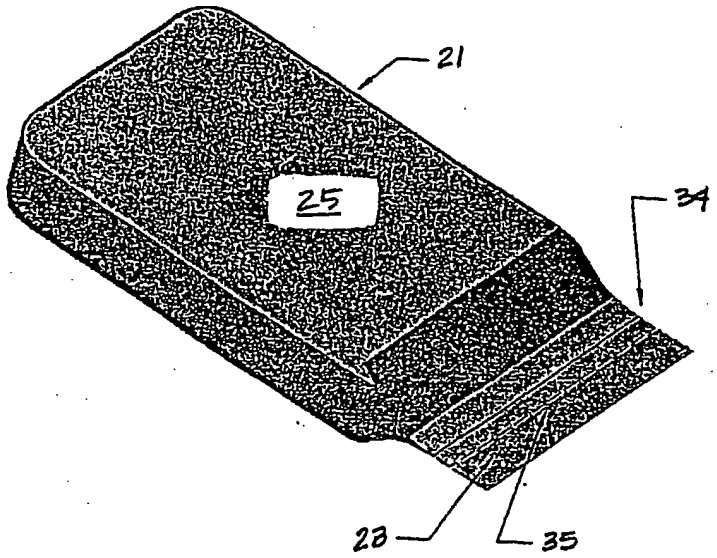



Fig. 2 (Prior Art)

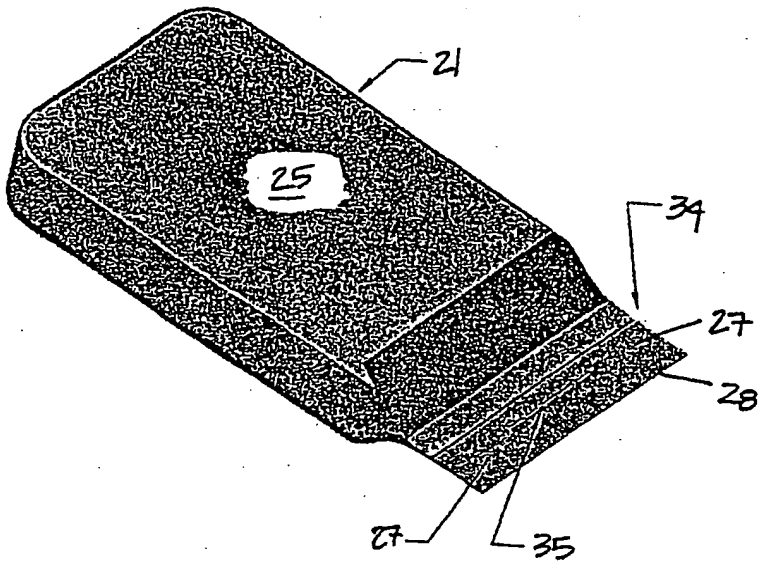



Fig. 3

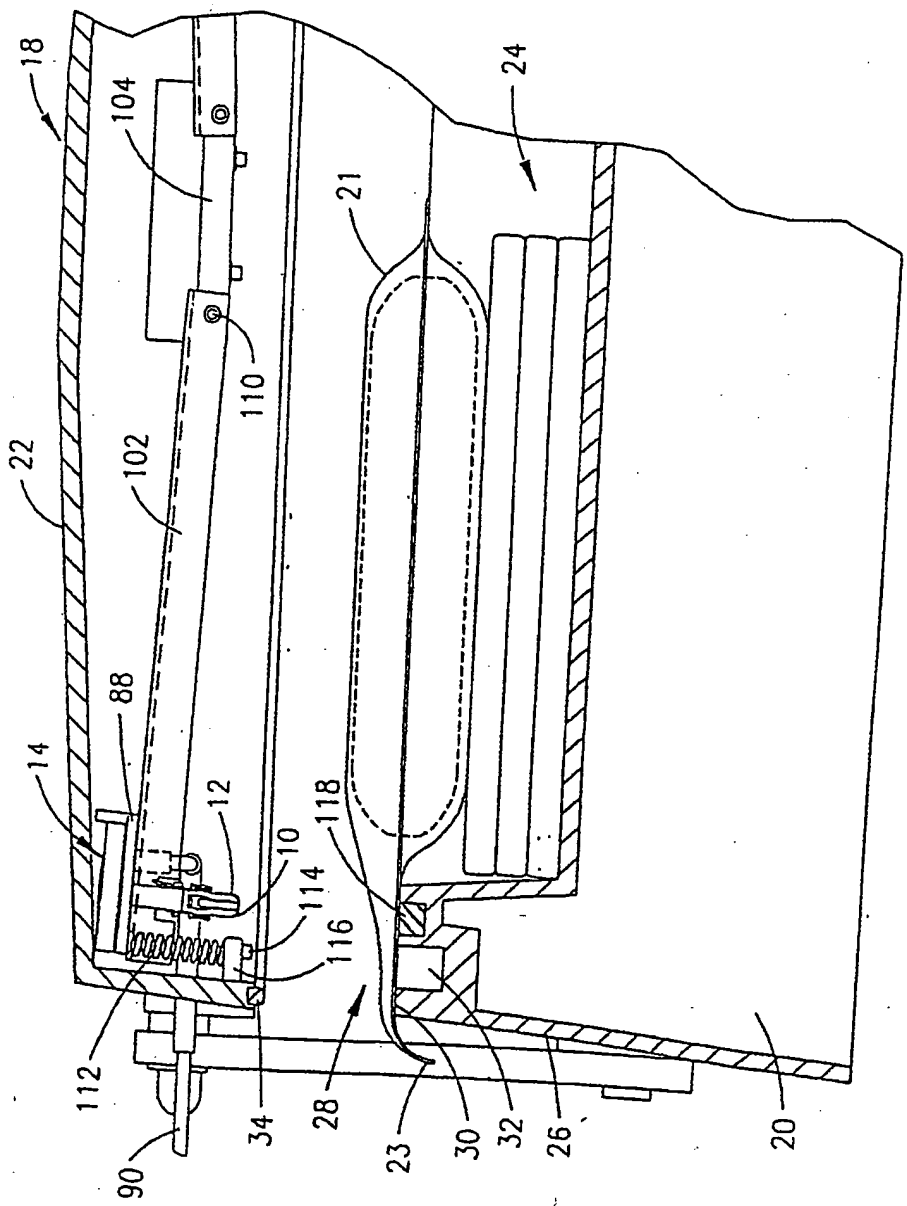

18
104
24
21
110
22
102
88
14
12
10
118
114
116
112
34
28
23
30
32
26
20
90

Fig. 4

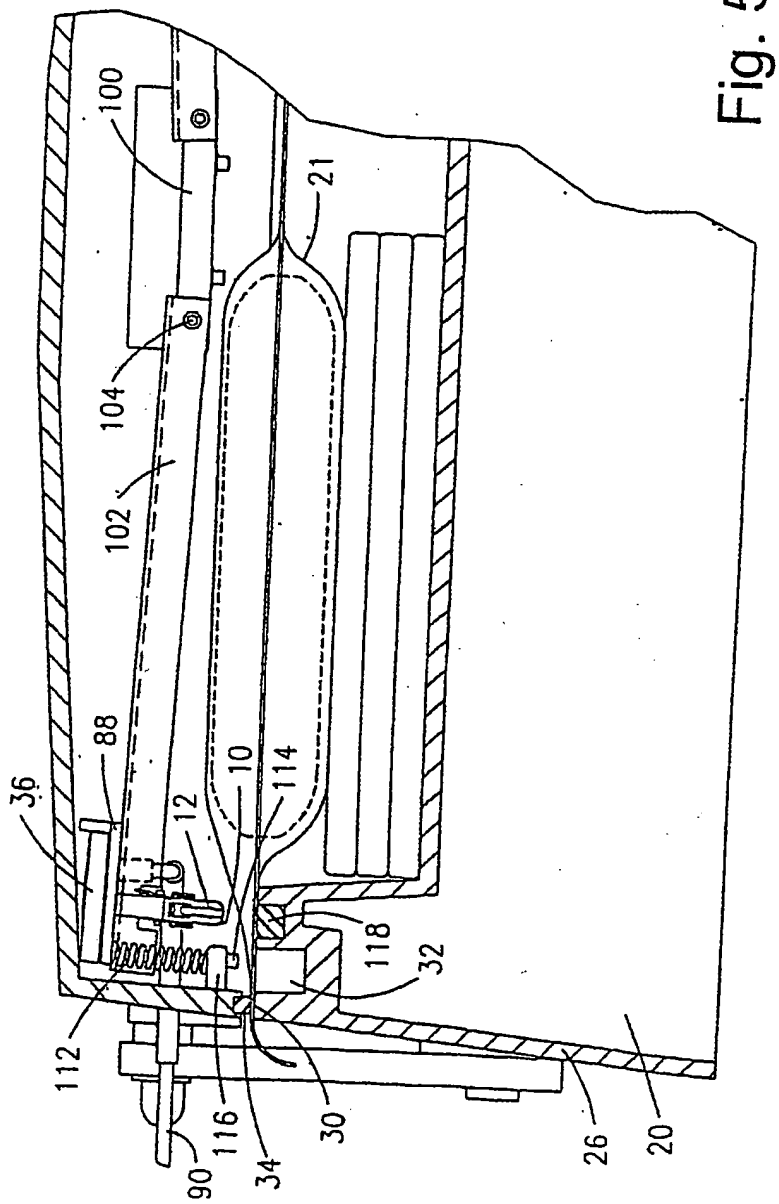



Fig. 5

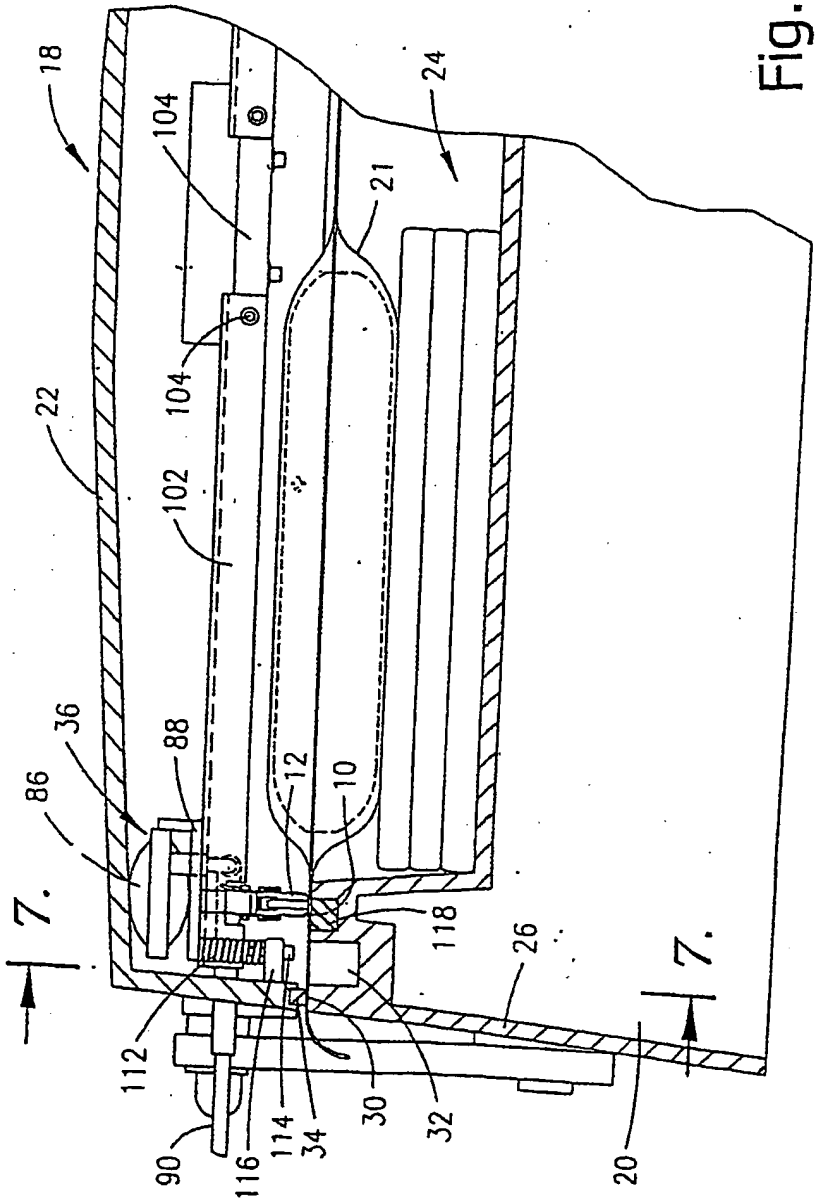

18
104
24
21
104
22
102
36
88
86
12
10
7.
118
26
7.
112
30
32
114
34
90
116
20

Fig. 6

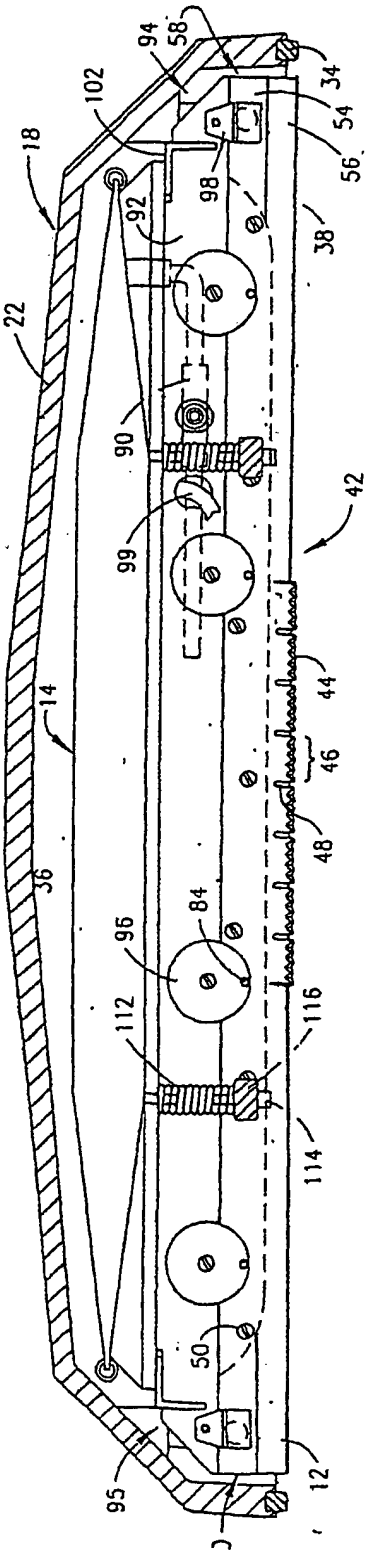
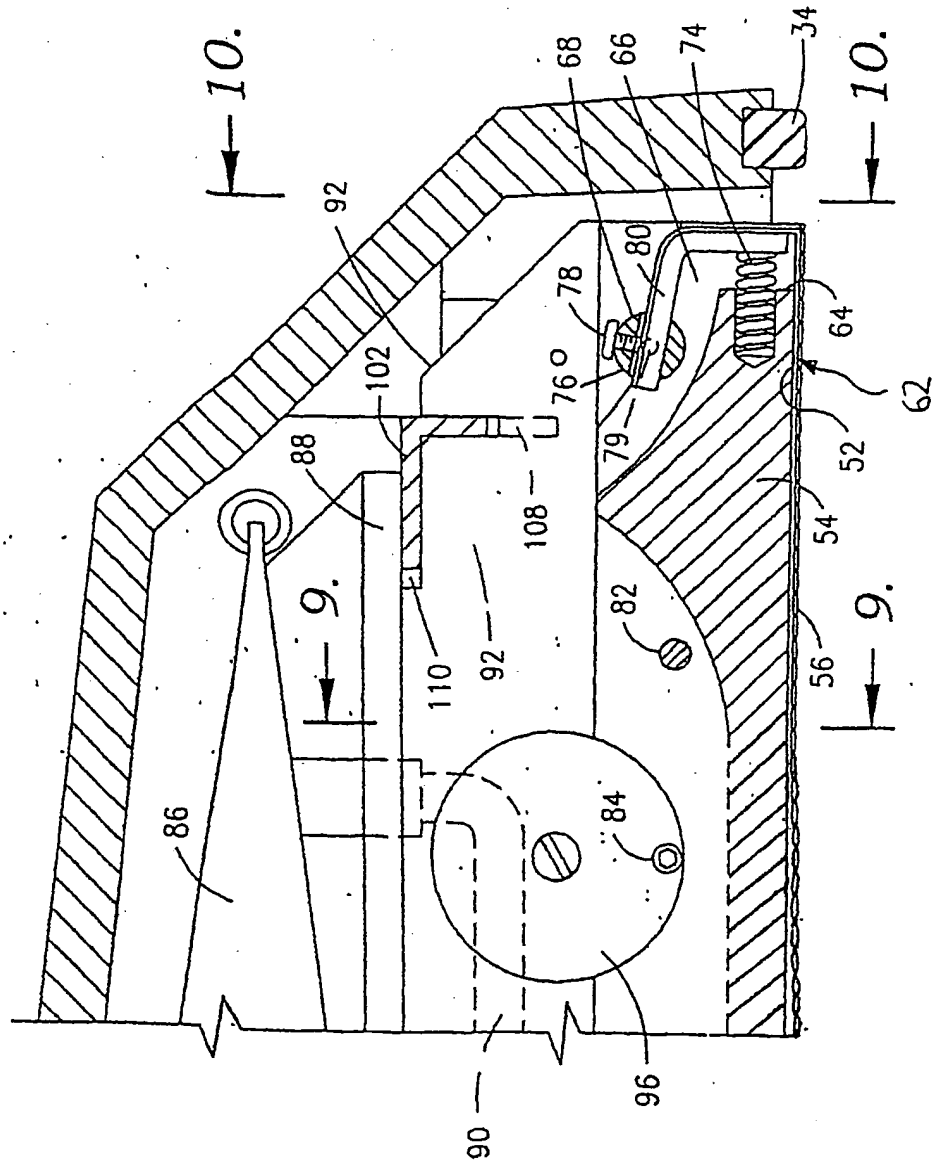

94
58
34
102
54
18
56
98
92
38
22
90
42
99
44
14
46
48
36
84
96
112
116
114
50
95
12

Fig. 7

Fig. 8


10.
10.
9.
9.
34
68
66
74
92
80
78
64
62
102
76
79
52
88
108
54
82
110
92
56
86
84
90
96

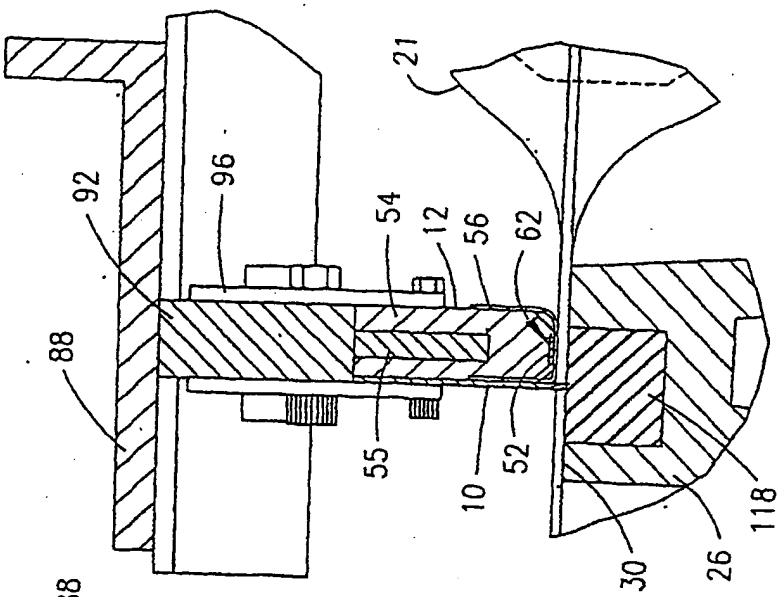

21
92
96
54
12
56
62
88
55
10
52
118
30
26

Fig. 10

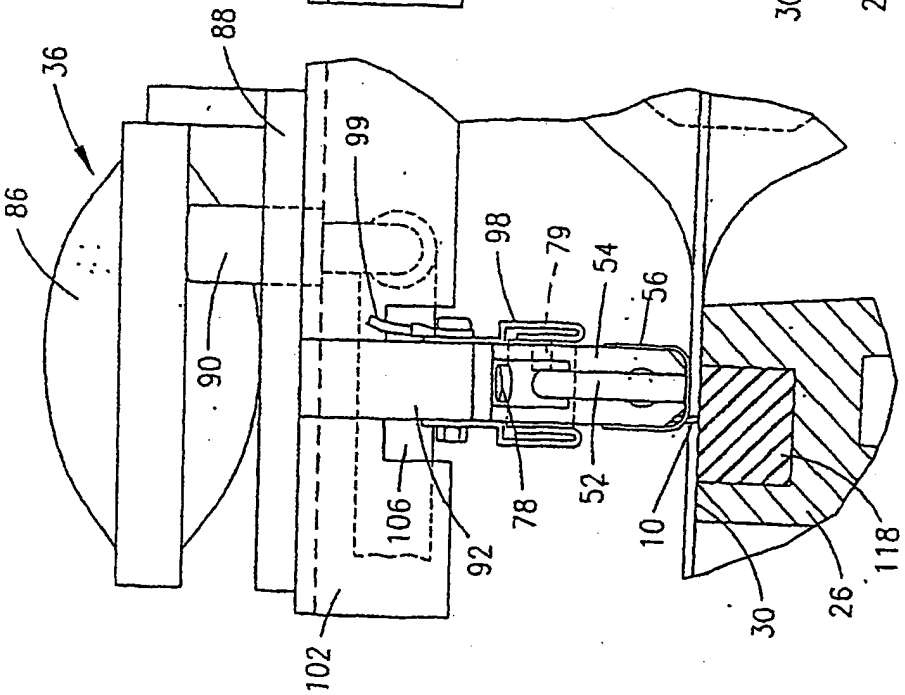

36
88
99
86
98
79
54
56
90
106
78
52
10
92
118
30
26
102

Fig. 9

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/02997

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : B65B 31/00
US CL : 53/79
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 53/79, 97, 105

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 4,779,398 A (Glandon et al.) 25 October 1988, see entire reference. | 1-12 |
| X | US 3,469,364 A (Bischoff) 30 September 1969, see entire reference. | 1, 12 |
| A | US 4,016,707 A (Puchosic) 12 April 1977, see entire reference. | All |
| A | US 5,056,292 A (Natterer) 15 October 1991, see entire reference. | All |
| A | US 4,189,897 A (Ailey, Jr. et al.) 26 February 1980, see entire reference. | All |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 29 April 2003 (29.04.2003) | 13 MAY 2003 |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (703)305-3230 | Authorized officer<br>Christopher R Harmon<br>Telephone No. 703-308-1148 |

Sheila H. Veney
Paralegal Specialist
Tech. Center 3700

Form PCT/ISA/210 (second sheet) (July 1998)